



# Infrared Visible and Optical Sensors (IVOS) subgroup Report

Nigel Fox

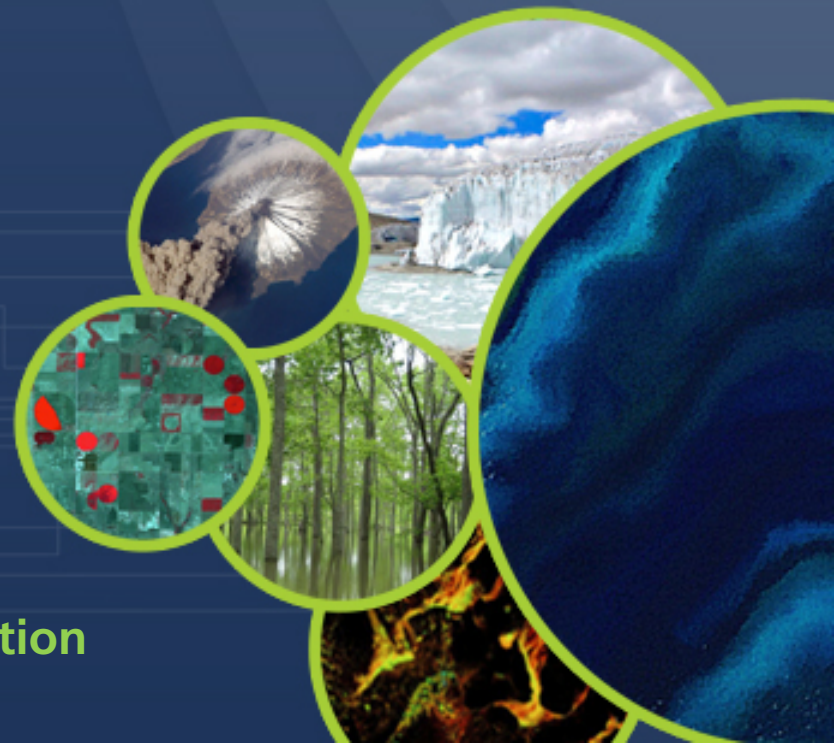
NPL (with UKSA support)

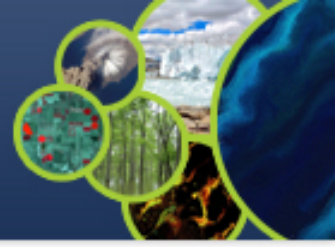
WGCV Plenary # 39

Berlin

May 6 - 8, 2015

**Working Group on Calibration and Validation**





## No IVOS 27 meeting as yet since last WGCV - delay due to optimising timing of key team effected in part by Sentinel 2

- IVOS 26 @ Pasadenda hosted by NASA JPL June 4-6
- 22 agency/orgs represented
- All themes and topics (work-plan discussed or summarised
- **Next Physical Meeting @ Toulouse, France hosted by ONERA (week of Nov 16 2015)**
  - Full week to include 2/3 workshops
  - Some webex planning to be organised shortly



### Special Projects:

- RadCALNet team met Feb @NPL
- SST/LST comparison now starting to be organised under ESA contract

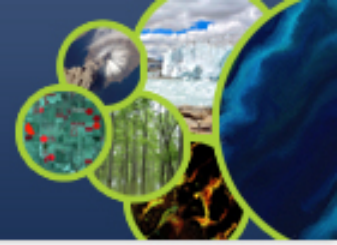
Working Group on Calibration and Validation

*To facilitate the provision of 'fit for purpose' information through enabling data interoperability and performance assessment through an 'operational' CEOS coordinated & internationally harmonised Cal/Val infrastructure consistent with QA4EO principles.*

- ***Pre-flight characterisation & calibration***
- ***Test – sites***
- ***Comparisons***
- ***Agreed methodologies***
- ***Interchangeable/readable formats***
- ***Results/metadata - databases***

**Key Infrastructure to be established and maintained independent of sensor specific projects and/or agencies**

Working Group on Calibration and Validation



- Approx 70 on email list
- Regular attending members (person/phone):

NASA

ESA

CAS (AOE)

CNES

JAXA

EU (JRC)

U of Arizona

U of Leicester

GSICS

STFC RAL

USGS

SDSU

SSTL

Digital Globe

Eumetsat

CSIRO

JPL

Vito

CSIR

Kari

ONERA

TNO

Raytheon

NPL

U of Zur

# Work scope: for optical sensors: (land/ocean)



**AGENCIES**

Pre-flight

Post-launch

On-Board

Vicarious

- Sharing best-practise
- Informal peer review
- Ref stds

Vis Sources  
Black bodies  
MTF  
Spectral  
.....

- Sharing best-practise
- Informal peer review
- Ref stds

Diffusers  
Black bodies  
...

Mission specific

Harmonisation /bias removal

- Sharing best-practise
- Informal peer review
- Tools/infrastructure

- Consistency
- Cost
- Suitability
- Usability

**‘SHARED’**

“Products”

Radiometric

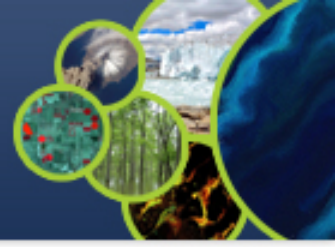
Geometric

“Image quality”

Test-sites / Methodologies

Algorithms/code

- Comparisons
- Traceability



## Structured into themes and led by 'champions' (Plus specific projects)

- Look to develop best practises
- Organise comparisons
- Shared learning (research activities)
- Shared infrastructure / tools / Methods
- Recommendations as needed

Land surface reflectance - Czapler Myers (U of Arizona USA)

Ocean colour (link to IOCCG, VC-OCR etc) - Zibordi (JRC, EU) & Murakami (JAXA JPN)

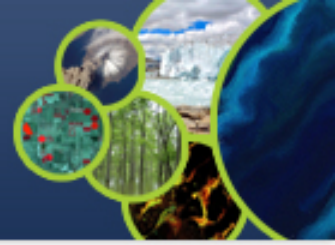
Surface Temperature (link to VC-SST, GHRSSST) - Corlett (U of Leicester, UK)

Geo spatial image quality - Helder (SDSU, USA) & Viallefont (ONERA F)

Atmospheric Correction (Link to AC subgroup) - Thome (NASA, USA)

RT codes (context of IVOS use in calibration) - Widlowski (JRC EU)

- **RadCALNet** - **Bouvet (ESA)**
- **Libya 4 (PICS) (with GSICS?)** - **Henry (CNES, F)**
- **SST/LST cross-comparison (+ VC-SST & LPV (instrument Cal for LST))** - **Fox (NPL, UK)**
- **Others in progress/development**
  - **Analysis of comparisons/Uncertainties/establishing and presenting harmonised biases for sensor to sensor comparisons (with GSICS) (including tools/databases)**
  - **Best practise for convolving spectral data sets (solar/surface/sensor bandwidth) (CEOS WGCV (sub-groups) & GSICS)**
  - **Comparison of Rayleigh and Sun-Glint methods**

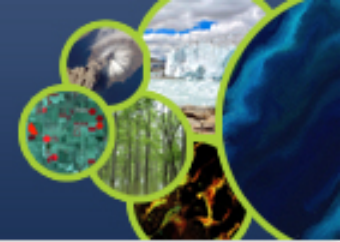


## Wk Nov 16 2015: Host ONERA Some workshops @ CNES

### POTENTIAL SCOPE of Week

- IVOS Meeting (2 days)
- RadCALNet task meeting (0.5 days)
- Geo spatial Image Quality Workshop (1 day)
- Libya 4 II (PICS) Workshop (0.5 day)
- Establishing & presenting harmonisation  
gain adjustments (bias correction)  
and Uncertainties Workshop (0.5 day)
- WGCV task team on Solar irradiance spectrum (0.5 day)





# **A Framework for Geo/Spatial Quality**

## **Status Report**

**CEOS-WGCV-IVOS**

**May 2015**

Current Sub-committee members:

Dennis Helder, Chair

Francoise Viallefont, Co-Chair

Jack Xiong, NASA

Derek Griffith, CSIR

DongHan Lee, KARI



South Dakota State University  
Image Processing Lab

- **Looking to establish community best practise of methods and relative uses for different applications/sensors together with catalogue of sites (manmade and natural) for use by the community.**
- In Progress
  - Solicitation for test site information sent May 2, 2014
  - Solicitation included request for best practices on PSF/MTF estimation
  - Webpages for test site database developed at USGS EROS
- To be Initiated this Summer
  - 2<sup>nd</sup> solicitation letter for test site information
  - Continued population of test site database web pages
  - Development of test data
  - Development of test algorithms



**New Spatial Test Site Web Page** hosted courtesy of USGS EROS Remote Sensing Technologies (Greg Stensaas, Jon Christopherson)

# Remote Sensing Technologies

understanding the technologies needed to sense our world

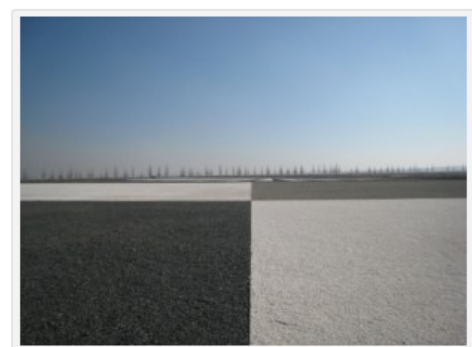
- Home
- Satellite & Sensor Characterization
- JACIE
- USGS Optical Science Lab
- R

You are here: Home » RST Resources » Test Sites Catalog » Spatial Sites » Baotou Comprehensive Calibration and Validation Site

## Test Site Catalog

### Site Location: Baotou Comprehensive Calibration and Validation Site

#### Spatial



Baotou Ground Level Image

- CEOS Reference Sites
- Radiometry Test Site Gallery
- Download Google Earth KMZ

#### GEOMETRIC SITES

#### SPATIAL SITES

#### ADDITIONAL INFORMATION

- Acronyms
- References



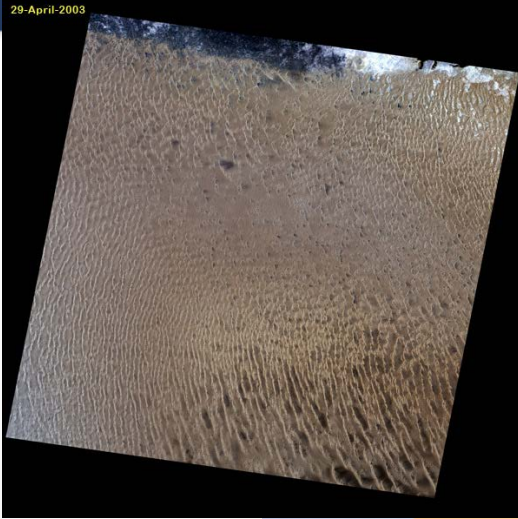
Location (City, State, Country): Baotou\_City, Inner Mongolia, China

[http://calval.cr.usgs.gov/rst-resources/sites\\_catalog/spatial-sites/](http://calval.cr.usgs.gov/rst-resources/sites_catalog/spatial-sites/)

Working Group on Calibration and Validation

- Proposed Presentations
  - Overview of the information collected
  - Pleiades MTF method
  - Kompsat3 MTF methods
  - Spot6 and 7 method
  - Landsat8 method
  - WorldView3
- Proposed Discussion Topics
  - Website development
  - Reference datasets
  - Methods comparison
  - Systematic image acquisition over MTF sites

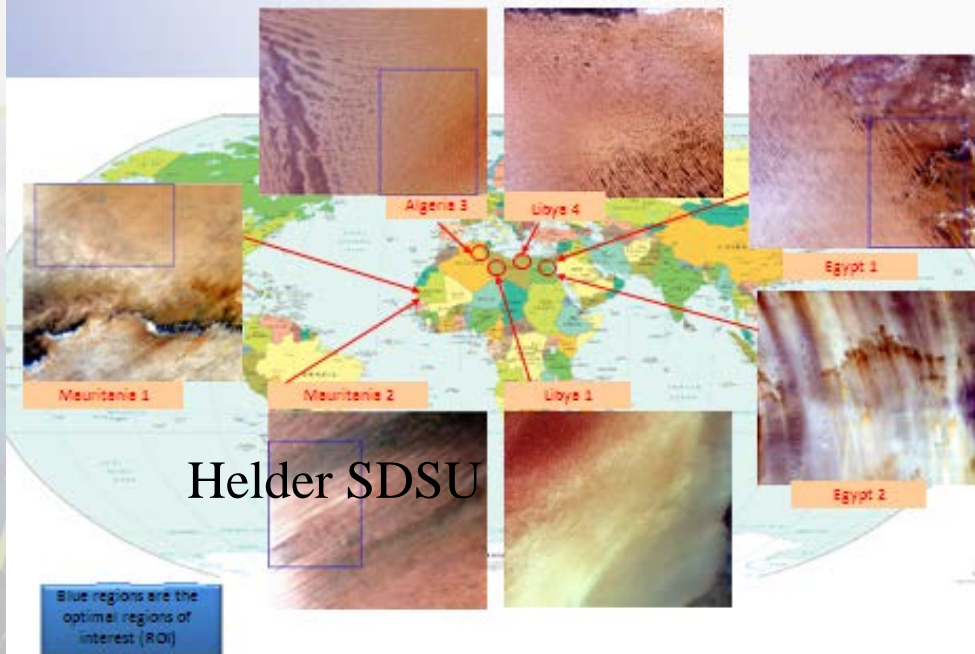
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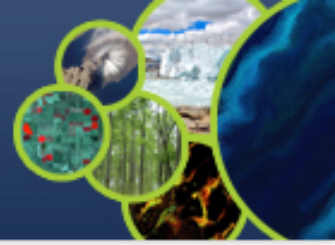


## Follow-on to First workshop in 2012 (Paris)

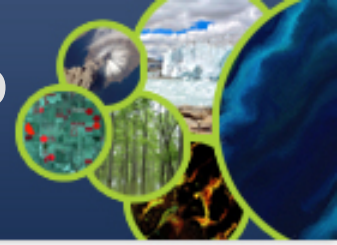
- ~25 attendees
- Working meeting
- Focus on one site
- Share ideas
- Different sensors
- Cal/comparison methods
- Site characteristics – observed/modelled
- High and medium res
- **What can & might be achievable?**

### OPTIMIZED SAHARAN PICS

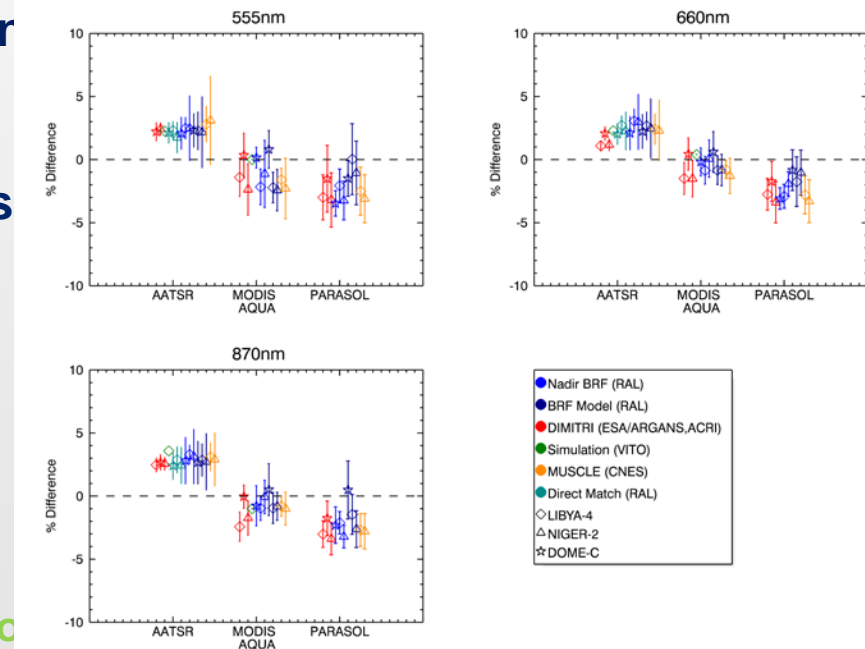




- **Pre-meeting telecon/webex to scope some potential community tasks for reporting at workshop.**
- **Encourage to hold with GSICS and also LPV experts on BRDF**
- **Review Progress on Calibration techniques for Libya 4**
- **Evaluation of Effects of similar and different BRDF models**
- **Potential to establish community best practise BRDF correction (model?)**
- **Medium / High resolution sensors, (sub-sites)**
- **Benefits of multiple sites**
- **Assessments and reporting of uncertainties**



- review data bases and tools used for cross-comparison (harmonisation?)
  - DIMITRI, MUSCLE, USGS?, NASA? GSICS....
  
- To initiate discussions on the ‘means of establishing and presenting community agreed L1 bias coefficients’
  - accounting for:
    - different Calibration/validation methods
    - Results of Post-launch Sensor to sensor to vicarious comparisons
    - Different scene types/observation
    - Per band / Virtual sensor ...
  
- Harmonised presentation of uncertainties

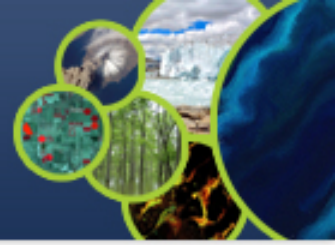


- Open meetings held annually (9 – 12 monthly)
- Reporting on progress by agencies by exception
  - New members encouraged to introduce
- Meeting to report/discuss progress on workplan/projects
- Meeting to Review/discuss Pre-flight Cal/Val techniques and strategies (optical sensors)
  - **Specific and generic**
- Various Technical discussion topics on topics of topical interest
- Co-locate project or other workshops groups
- Major workshops (tri-annually)

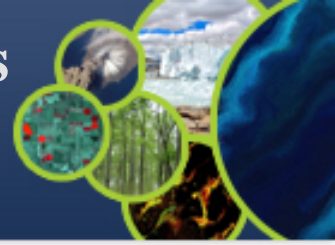




- Activities of VC-SST and priorities plans for SST (LST) comparison project
  - Concept of Fiducial reference measurements
- Ocean colour activities – plans for comparison and preparations for Sentinel 3  
Concerns of creation of parallel Cal/Val groups in CEOS (In-Situ-OCR) including sensor pre-flight
- Review of various sensor Cal activities
  - **Desire to establish a 3 day workshop (potentially across Sub-groups & GSICS) on pre-flight/on-board Cal of ‘optical based sensors’ 2015/2016**
  - Discussion on Climate/calibration benchmark missions: US, UK/Europe, China
  - **Potential joint workshop in collaboration with GSICS**
- Geo-spatial image quality
  - Reinvigorating discussion on this topic (lead D Helder of SDSU) **plan for 1 day workshop at IVOS 27 encourage agencies to support with personnel and to provide details on Geo-spatial test sites for CEOS (USGS) catalogue** **NEED WGCV SUPPORT TO MOVE FORWARD**



- The Moon as a calibration reference
  - **Workshop organised by GSICS (Dec 2014) to harmonise and compare uses and variants of USGS originated ROLO model**
- RadCALnet
  - Cross-agency Agreement on project 2yr work-plan for prototype operational traceable radiometric Cal service for <50 m land imaging sensors
  - Strategy to find a 4<sup>th</sup> ESA/CNES funded site via a global search
- Pseudo-Invariant-Calibration-Sites (PICS) particularly Libya 4
  - ESA plans to do site visit to collect samples
  - LPV offered support to collaborate on modelling BRF of dunes etc
  - **Propose a second Libya 4 workshop at IVOS 27 in collaboration with GSICS compare results, use some standard test data etc (arrange telecon to plan a potential project)**
- Treatments of Spectral bandwidth and convolution with sensors, surface, solar
  - **Potential project to develop best practice guidance and how to treat uncertainties as WGCV activity in collaboration with GSICS (including interpolation various scales (spectrometer resolution to broadbands))**
- Sensor to Sensor comparisons and analysis
  - Discussion on tools and databases
  - How to link/present results - ref to an arbitrary named sensor, on a bi-lateral basis, to a CEOS virtual reference? Coordination/harmonisation of different results?
  - **Plan to have workshop at IVOS 27 with GSICS to discuss community strategy**



- **Deserts (PICS) methods for cross- comparisons (Vis and IR)**
- **Moon as a calibration reference - improved models and useage**
- **LEO – LEO cross-calibration methods in general**
- **Cross-comparison tools and databases and results**
- **Pre-flight calibration workshop**
- **Use of atmospheric hyperspectral imagers for band to band correction**
- **Reference solar Irradiance spectrum & methods to convolve with instrument bands**
- **Efforts to establish SI Traceable Climate and calibration sat in space**
- **Many overlaps of personnel perhaps some joint co-located meetings**
- **Surface measured test-sites and associated in-situ / cross comparisons is of supporting interest to GSICS**
- **Contribution to survey on Cal/val methods: activities/priorities**
- **Strategy for common method to report sensor to sensor biases**